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NATURAL GAS NETWORK RESILIENCY MODELING

MODEL OVERVIEW

The National Infrastructure Simulation and Analysis Center (NISAC) models natural gas flow and storage throughout North America to inform analyses of the availability of natural gas in the event the natural gas supply chain is disrupted. Based on a pipeline network model, the North American Natural Gas System Model can be used to study complex, time-dependent, continent-wide interactions among producers, pipelines, storage facilities, and consumers.

MODEL CHARACTERISTICS

- Model network consists of nodes, representing:
  - Supply areas (production and processing assets)
  - Demand areas (residential, commercial, industrial, and electric customers)
  - Storage facilities
  - Market hubs
  - Pipeline interconnects
- Nodes are connected by links, representing the pipeline network.
- Model algorithms calculate gas pipeline flows and storage facility inventories, subject to capacity constraints and supply/demand pressure, while allowing adaptive responses such as:
  - Pipeline shipment rerouting
  - Storage inventory drawdown
- Simulations can be resolved to the days or months level.
- Multi-period simulations may be run to study, for example, short-term pipeline disruptions, seasonal demand fluctuations, or long-term changes in the natural gas system.

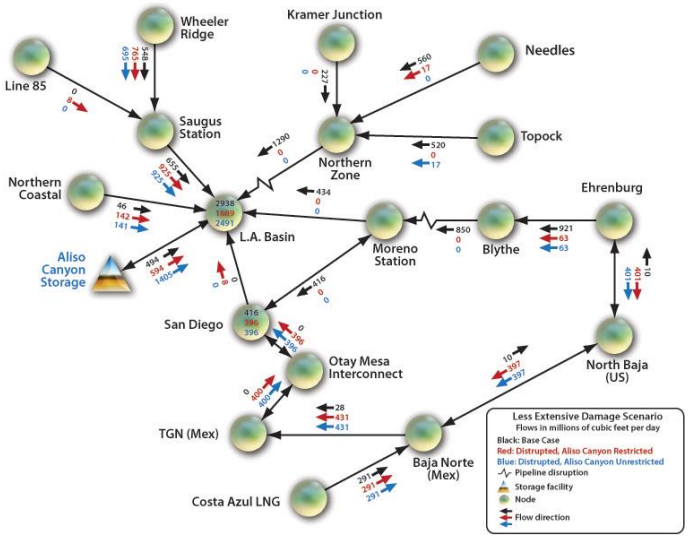
MODEL APPLICATIONS

- Emergency planning for major natural disasters.
- Interdependencies with electrical sector when coupled with an electric dispatch model.
- Potential impacts of disruptions at production areas, processing plants, storage facilities, and pipeline transportation infrastructure.
- Potential impacts of unusually high gas demand periods.

QUESTIONS ADDRESSED

This capability is designed to assist decision makers understand how the natural gas supply chain responds to disruption by addressing questions such as:

- Which regions of North America will experience natural gas shortages after a specific disruption to one or more components of the natural gas infrastructure?
- What would be the duration and magnitude of shortages?



NISAC analysis of natural gas availability in Southern California following a "ShakeOut" scenario earthquake.

ABOUT OCIA

The Department of Homeland Security, National Protection and Programs Directorate's (NPPD) Office of Cyber and Infrastructure Analysis (OCIA) manages NISAC, which is a Congressionally mandated center of excellence in modeling, simulation, and analysis of critical infrastructure.

CONTACTS

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